



# Monitoring of growth potentials in fresh water prawn *Macrobrachium rosenbergii* feeding with experimental diets with different nutrients

Bhavani M<sup>1</sup>, Sujay Kumar G<sup>2\*</sup>, Hareesh<sup>1</sup>, Srinivasulu Reddy M<sup>3</sup>

1.Department of Zoology, S.V.University P.G Centre, Kavali-524 201, India

2.Department of Marine Biology, Vikrama Simhapuri University, Nellore-524 001, India

3.Department of Fishery Science & Aquaculture, S.V.University, Tirupati-517 502, India

\*Corresponding author: Department of Marine Biology, Vikrama Simhapuri University, Nellore-524 001, A.P., India; E-mail: sujayvsu@gmail.com

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## General Note



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## ABSTRACT

Fresh water prawn *Macrobrachium rosenbergii* was subjected to feeding trail experiments with four different types of diets formulated with different proportions of feed ingredients for 120 days. The feed ingredients include protein supplements like Fish meal, Mussel meal, Squilla meal, Squid meal etc and energy supplies including wheat flour, rice bran, corn meal, ground nut oil. The results obtained in the present study clearly demonstrate that Diet III containing Fish meal: Mussel meal: Squilla meal & Suid meal in the proportion of 20:15:10:10 along with soybean meal: Wheat flour: Ground nut oil: Rice bran: Corn meal in the ratio of 10:10:10:5:5 included highest growth potentials compared to remaining diets. The results obtained demonstrate that the diet containing crude protein of 45% around is most suitable for culture activity of fresh water prawn *M.rosenbergii*. *Macrobrachium*.

**Key words:** Fresh water Prawn, growth potentials, Feed Ingredients: Fish Meal, Mussel Meal, Squilla Meal, and Squid Meal etc.

## 1. INTRODUCTION

Under the banner of Blue Revolution, to increase the protein production through culture of aquatic species i.e. Aquaculture, the prawn farming practices has come into existence in Andhra Pradesh. After the collapse of prawn culture of *Penaeus monodon* due to disease out breaks, the aqua farmers explored the alternative candidate species i.e. fresh water prawns. Because of faster expansion of fresh water prawn farming all over the world (Fujimura & Okamoto 1972; Ling, 1969). Out of 125 species of *Macrobrachium* in the world, 45 species are of commercial importance. The giant fresh water prawn *Macrobrachium rosenbergii* considered to be most efficient species from culture aspect due to its fast growth rate, omnivorous feeding habit, hardy as well as its efficient feed conversion. Therefore *M. rosenbergii* is most suitable for culture due to its large size and its less aggressive nature under culture conditions. *M. rosenbergii* is found extensively in the tropical and sub tropical fresh waters of India, Srilanka, Thailand, Philippines. It generally found in fresh water, in ponds, rivers, lakes, canals, low-lying flood plains etc. Approximately 25 species belonging to *Macrobrachium* genus, became commercial and are found to be present in Asia and the Pacific. Most of the species are also known to inhabit in India also (Muir & Lambardi, 2000, Tayamen, 2001). The farming of giant fresh water prawn *M. rosenbergii* popularly known as "Scampi" has been expanding in India rapidly in recent years (New & Csavas. 1993) due to its large size attainment, tolerance to water quality changes, ability to cope with handling stress and ability to feed on conventional feeds (New & Valenti. 2000).

Though the fresh water prawns occupied an important place in the export trade owing to their high market value, their farming practice was still in its infancy. Keeping the above literature, the present investigation is aimed to investigate the nutritional requirements for fresh water prawn *Macrobrachium rosenbergii* by formulating different diets consisting of different types of feeding ingredients including high protein containing substances like Fish meal, Squilla meal, Squid meal and Mussel meat and high carbohydrate containing substances like Soy bean meal, Wheat flour, Corn meal to supplement energy levels in the feed. The present investigation will pave way for the disclosing of requisite nutrient substances for formulation of feeds for *M. rosenbergii* culture activity.

## 2. MATERILS AND METHODS

Fresh water prawns *Macrobrachium rosenbergii* (de Man) were collected from local Aquaculture ponds, near Kavali and were brought to the laboratory and were acclimatized to laboratory conditions for 2-3 days in 12:12 L:D cycle. Prawns of equal size 2.55 – 0.38 g were sorted and were reared in Aqua tanks of 100x 50x 50 cm with whitish back ground. The culture tanks were continuously aerated by means of Electric compressor. Poly vinyl

chloride (PVC) tubes and stones were put on the bottom of Aqua tanks as sheltering place for prawns. The prawns were fed ad libitum every day in the morning 6.00 A.M with commercial diet. The present experimental study was conducted during October, 2012 to January, 2013 i.e. for four months.

Prior to one day of experimentation, the feeding of prawns with commercial diet was stopped. The prawns of equal size were selected and sorted into four batches i.e. into four aqua tanks. Feeding content was adjusted on daily observations of feed intake of prawns. Total feed ration was divided into two parts about 2/3 of total feed was given around 6.00 A.M and remaining 1/3 of feed was given around 6.00 P.M. The residual feed particles and excreta were siphoned out regularly both in the morning and evening. Every day 50% water exchange was conducted during night times. All the prawns placed in four aqua tanks were fed with four different types of formulated diets i.e. Diet-1, Diet-2, Diet-3 & Diet-4. The feeding trail experiment was conducted for 120 days. At the end of the experiment, all the prawns from each tank was weighed and recorded. The ingredient composition of experimental diets was presented in Table.1.

Prawns were measured for weight once in every 15 days and water sample collection for analysing of Physico-Chemical parameters such as dissolved oxygen,  $P^H$  and temperature. Apart from the above data was also generated once in a week for water parameters.

Growth measurements including Body weight (g) of prawns were measured by weekly and from the data obtained weight gain (WG) (g) and WG %, Specific Growth Rate (SGR), Normalized Biomass Index (NBI), were calculated by adopting the formulas mentioned below.

$$\text{Weight Gain (WG)} = \text{Final weight (g)} - \text{Initial weight (g)}$$

$$\text{Weight Gain (WG) \%} = \frac{\text{Final weight (g)} - \text{Initial weight (g)}}{100}$$

$$\text{Specific Growth Rate (SGR)} = \text{Normalized Biomass Index (NBI)}$$

$$\frac{(\text{Final weight} \times \text{prawn Nos}) - (\text{Initial weight} \times \text{Prawn Nos})}{100}$$

$$\text{Survival Rates} = \frac{\text{Final Nos of prawns}}{\text{Initial Nos of prawns}} \times 100$$

Water quality parameters including temperature,  $P^H$  and Dissolved oxygen were measured using standard methods for

the examination of water and waste water (APHA, AWWA and WPCF, 1995).

The data obtained was subjected to statistical analysis for one analysis of variance (ANOVA) with Duncan's Multiple Range Test (DMRT) in SPSS in MS Excel 2010. To find out the significant differences among the treatment groups for Growth Studies at different composition of experimental diets.

### 3. RESULTS AND DISCUSSION

Growth parameters of Fresh water prawn *Macrobrachium rosenbergii* after feeding trail experiments with four different types of experimental diets were presented in Table.2. All the four diets formulated in the present study were showed to induce the best and highest growth potentials in prawn *M.rosenbergii*. The weight gain obtained for prawns after fed with four diets is as follows. Maximum Growth rates were obtained with Diet-III i.e. 43.13 g followed by 41.86 g by Diet-IV, 33.16 g by Diet-II and finally 29.15 g by Diet-I. The weight Gain (%) also showed a similar kind of trends i.e. maximum gain percentage with Diet-III followed by Diet-IV, Diet-II and minimum recorded with Diet-I. Specific Growth Rates calculated for the four experimental diets also clearly depicts that highest SGR recorded with Diet-III (1.083), followed by 1.066 for Diet-IV, .990 for Diet-IV and minimum of 0.978 for Diet-I. The Food Conversion Ratio (FCR) values obtained for the formulated experimental Diets also showed best and efficient FCR values with Diet-III (3.24) followed by 3.72 for Diet-IV, 4.42 for Diet-II and a maximum of 4.85 with Diet-I. The values obtained for Normalized Biomass Index (NBI) recorded maximum value of 14.30 with Diet-IV followed by 13.39 with Diet-III, 9.13 with Diet-II and minimum of 6.12 with Diet-I. The percent survival values obtained in the present investigation, i.e. highest survival values recorded with Diet-IV is 70% and followed by 64% with Diet-III, 58% with Diet-II and minimum survival of 46% with Diet-I. The crude protein (CP) values were estimated for all the experimental diets and presented in Table. Diet-I recorded CP value of 21.34, followed by 35.23 for Diet-II, 45.71 for Diet-III and a maximum of 55.12 with Diet-IV.

$$\left[ \frac{\text{Log Final weight (g)} - \text{Log Initial weight (g)}}{t} \times 100 \right]$$

The Physico-Chemical analysis of water parameters including the monitoring of temperature, P<sup>H</sup> and Dissolved oxygen (DO) were recorded. The results obtained for fluctuations in water temperature, P<sup>H</sup> and DO during feeding trail experiments with four different diets for prawn *M.rosenbergii* were presented in Table. The DO values during feeding trail experiments was ranged between 6.1 to 6.8 mg/lit whereas P<sup>H</sup> values are 7.82 to 8.42. The DO content, P<sup>H</sup> range and temperature values were

found to be ideal for the best of maximum growth potentials during the feeding trail experiments of prawn *M.rosenbergii* fed with four different types of diets.

The four diets formulated in the present investigation are reasonably very efficient in inducing the growth potentials in prawn *M.rosenbergii*. But the four diets induced different levels of growth i.e. differential growth levels in *M.rosenbergii* may be attributed that, the ingredients incorporated in the feed formulation and other factors may likely to influence the different patterns of growth in prawns. Majorly all the experimental diets are known to possess high protein containing substances include Fish meal, Mussel meal, Squilla meal and Squid meal, high carbohydrate containing substances including soy bean meal, wheat flour, corn meal and lipid containing substances Ground nut oil and Rice bran in different proportions. Most probably the feed ingredients incorporated during the formulation of diets for prawn might have played an important role in the differential growth rates recorded in the present investigation. Different authors also reported the differential requirement of proteins, carbohydrates and other substances in the formulation of diets for prawn *M.rosenbergii* (Chowdary et al 2008 & Rangappa, 2011).

**Table 1**

Composition of Experimental Diets

S.No	Ingredient	Diet-I	Diet-II	Diet-III	Diet-IV
1	Fish meal	5	15	20	10
2	Mussel meat	5	10	15	15
3	Squilla meal	5	10	10	15
4	Squid meal	5	10	10	10
5	Soya bean	10	10	10	10
6	Groundnut oil	10	10	10	5
7	Wheat flour	20	10	10	10
8	Rice bran	10	5	5	5
9	Vitamin mixture	5	5	5	5
10	Corn meal	25	15	5	15
Crude Protein (%)		21.34	35.23	45.71	55.12

The researchers also studied the effect of dietary protein and every on the growth potentials of fresh water prawn *Macrobrachium rosenbergii* and concluded that the dietary energy levels improved growth and feed efficiency (Mitra, et al 2005, Habashy, 2009 & Gomez et al 1988).

In the present study the ingredients selected for formulation of experimental diets include fish meal, mussel meal, squilla meal, squid meal are of good quality proteins and are capable of inducing highest growth potentials in prawns including *M.rosenbergii*. It has been already established that the selected feed ingredients are also possessing a good quality of essential amino acids, which play an important role in the enhancement

of growth in fresh water prawns. In all the four diets formulated the selected ingredients were incorporated at different levels. The growth potentials observed in the present investigation also clearly depicts that, all the four diets formulated are capable of inducing best growth rates in fresh water prawn *M.rosenbergii* during in feeding trail experiments.

**Table 2**

Growth parameters record in fresh water prawn *M.rosenbergii* after fed with different experimental diets.

Expt Diet No	Initial weight	Final weight	Weight gain (g)	Weight gain (%)	Specific Growth Rate (SGR)	FCR	Normalized Biomass Index	Survival (%)
Diet-I	2.18±0.13	31.33±0.48	29.15±0.43	1337	0.978	4.85	6.12	46
Diet-II	2.31±0.21	35.47±0.54	33.16±0.48	1435	0.990	4.42	9.13	58
Diet-III	2.28±0.19	45.41±0.65	43.13±0.59	1892	1.083	3.24	13.39	64
Diet-IV	2.32±0.23	44.18±0.85	41.86±0.73	1804	1.066	3.72	14.30	70

**Table 3**

Dissolved Oxygen (DO) levels in the experimental tanks during October 2012-January 2013 culture period

Expt Diet No	Oct	Nov	Dec	Jan
Diet-I	6.6±0.18	6.5±0.15	6.3±0.15	6.1±0.16
Diet-II	6.8±0.18	6.7±0.19	6.1±0.15	6.0±0.15
Diet-III	6.7±0.17	6.5±0.18	6.3±0.15	6.1±0.17
Diet-IV	6.6±0.18	6.5±0.17	6.3±0.15	6.1±0.15

The differential growth rates observed in the present investigation with different diets may be attributed to their presence and supplementation of essential amino acids for the growth patterns in prawns. The crude protein content in the formulated experimental diets also varies significantly i.e. Diet-I possessing 21.34% CP, where as Diet-II (35.23%), Diet-III (45.71%) and Diet-IV (55.12%). The highest and best growth rates wre achieved with Diet-III containing 45.71%, crude protein in prawns/ Earlier reports on *M.rosenbergii* indicates that fresh water prawn required dietary supplements with a protein content of 45.71%. The results obtained in the present

investigation for SGR, WG% and survival rates also supports thatm Diet-III ith a crude protein content of 45.71% is ideal for pran *M.rosenbergii* for inducing higher growth rates compared to Diet-I&II having lower protein contents and are unable to meet the requirements of the protein demands of the prawns. But in the case of Diet-IV, even though it is possessing a crude protein of 55.12%, but most probably the Diet-IV is unable to meet the supply demand of the prawn or the amount of EAA quality available for prawn growth is not adequate. The Diet-III containing Fish meal, Mussel meal, Squilla meal, Squid meal in the ratios of 20:15:10:10, which served as a best EAA

supplement for the prawn to show best growth rates compared to Diet-IV consisting of Fish meal (10%), Mussel meal (15%), Squilla meal (25%) and Squid meal (10%) and unable to provide the requisite amounts of EAA to perform the induction of best growth potentials. The Food Conversion Ratio (FCR) values obtained in the present investigation also clearly reveals that all the four diets formulated are showing relatively

higher efficacy and efficiency in catering the needs of the prawn and hence the growth potentials are relatively higher in prawns after subjected to the feeding trail experiments.

**Table 4**

P<sup>H</sup> of water samples in the experimental tanks during October 2012-January 2013 culture period

Expt Diet No	Oct	Nov	Dec	Jan
Diet-I	8.38±0.03	8.32±0.03	8.02±0.03	7.82±0.05
Diet-II	8.42±0.04	8.35±0.04	8.12±0.05	8.08±0.04
Diet-III	8.34±0.03	8.32±0.04	8.20±0.06	8.12±0.05
Diet-IV	8.30±0.03	8.25±0.05	8.15±0.05	8.02±0.04

The FCR values are also in the reasonably very good range i.e. 3.24 to 4.85, for the formulated diets explains the efficient conversion of diet into the stuff of the body in the prawn *M.rosenbergii*. In the present study, with an increase in the protein content in the diets, substances responsible energy production i.e. dietary energy produces also added, which in turn facilitate the induction of better growth rates. It has been

already reported that in the presence of sufficient amounts of carbohydrates, the protein sparing action towards conversion of protein into the stuff of the body is relatively higher compared to diets without sufficient amounts of carbohydrates (Glencross, 2003).

From the results obtained in the present investigation it can be concluded that the feed ingredients selected in the present study in the incorporation of experimental diets are of good quality and capable of inducing highest growth rates in prawn in *M.rosenbergii*. Among the four diets formulated Diet-III with

45.71% of protein content capable of showing better efficiency in terms of FCR, and also induced highest growth rates compared to other experimental diets. So, the Diet-III with an 45% crude protein in it is suitable and ideal for fresh water prawn culture *M.rosenbergii*.

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